Making Wood Rings with Stainless Steel Insert Centers

Background

These notes describe how to make a ring with a stainless steel insert and a wood exterior band. They also include information on how to make the necessary ring mandrel that is required to turn the wood exterior band.

A wooden ring without the SS insert can be made using many of the same techniques, however, the ring will be weak, even if the wood is stabilized, and probably crack either during construction or while wearing it. Also, with the SS insert, the ring can be made much thinner and is more attractive and comfortable to wear.

When choosing wood for the ring, spindle blanks are best because the grain will run across the ring and there will be no end grain showing on the ring. In the case of burls, it does not matter, since there is generally no pronounced grain direction. Choose a wood that has a grain pattern that is small relative to the ring size, otherwise there may only be a couple of grain lines showing on the ring. Good woods are burls, dyed burls, cocobolo, zebrawood, red heart, pink ivory, blackwood with white sapwood, highly figured maple and spalted wood if the spalt lines are close together. Examples of finished rings are shown in Figure 1.

Figure 1. Dyed burl, cocobolo and spalted maple rings

Materials Needed

1. Wood for rings
2. Stainless Steel insert – sizes 5 to 13 can be purchased from Woodworkers Emporium at http://www.woodworkersemporium.com
3. #2 Morse taper drill chuck
4. Small centering bit
5. Twist drill bits
6. Flexible CA glue – EM-150 can be purchased from http://www.starbond.com/
7. Thin CA glue for finishing
8. CA accelerator
9. Various grades of sandpaper and silicon carbide paper
10. White diamond and carnauba buffing wheels
11. Straight grained wood for the ring mandrel – maple works well
12. Small sharp spindle gouge
13. Sharp parting tool
14. Dial or digital calipers

Mandrel Construction

The ring mandrel (shown in Figures 2 and 3) is used to hold ring inserts of size 5 to size 12 for final turning, sanding and finishing. The left end has a tenon for mounting in a chuck and the right end has a 60° cone cut with the centering bit and four stepped tenons turned to fit the ID of odd ring sizes from 5 to 11. It is necessary to size them for diameters that skip a ring size so there is a large enough shoulder that the ring can reference against for turning. However, the even sizes can be mounted on the smaller odd size steps and the mandrel expanded to hold them. That way only one mandrel is needed. Between the chuck tenon and the stepped tenons, there is a cove that enables the mandrel to flex easily. The mandrel is then split with two cuts perpendicular to each other just past the center of the cove so it can be expanded to hold the ring using a 60° live center in the cone cut. Figures 2 and 3 are pictures of an example mandrel.

Figure 2. Ring mandrel Side View

Figure 3. Ring mandrel End View

Steps in Turning a Mandrel

1. Prepare a spindle blank that is thick enough to make a tenon for your chuck and mark the centers on both ends. Typically 1½" X 1½" square to 2" X 2" square and 3" long is about right. The blank should have straight grain since you will be expanding the mandrel to hold the ring and do not want it to crack because of grain runout.
2. Mount the mandrel blank between centers, rough turn it round and then turn a tenon to fit your chuck on one end. It is best to size the tenon so that the chuck jaws are almost closed when gripping the mandrel tenon.
3. Mount the mandrel in a chuck using the tenon. Mark jaw #1 so that when you remount the mandrel it will run true.
4. Using a centering bit, drill a 60° conical hole deep enough so that the tapered part of the bit cuts a 1/4" diameter tapered hole in the end of the mandrel.
5. Rough turn the first 2" of the right end of the blank to about 1" in diameter.
6. Use a parting tool to cut a tenon about 0.680" diameter (slightly oversize for the size 5 ring's ID of approximately 0.620") 3/8" wide on the right end to set an approximate diameter. Carefully finish turning the tenon to a diameter of 0.620". Repeat this process to turn three more 1/4" wide tenons with diameters of 0.689" (size 7 ID), 0.749" (size 9 ID) and 0.818" (size 11 ID). An accuracy of ±0.005 is fine.
7. Turn a cove with a minimum diameter of approximately 3/4" starting about 1/4" from the chuck jaws to 1/4" from the largest ring tenon, making sure to leave a shoulder for that tenon. Also reduce the 1/4" shoulder to the left of the last tenon to about 1/8" larger than the tenon. This is necessary so you can access both sides of the ring when it is mounted on the mandrel.
8. Remove the mandrel from the chuck and cut two slots perpendicular to each other from the 60° hole just past the center of the cove. A bandsaw is the best way to do this using a V-block to hold the mandrel.

Ring Construction

1. Loosely chuck one end of a 1½" square ring spindle blank diagonally in the chuck jaws and use a live center on the opposite end to center the blank. Tighten the jaws and remove the live center.
2. Select a SS insert and measure the OD of the insert with dial calipers.
3. Set the dial caliper to half the diameter, and using the sharp points of the dial caliper's ID jaws, put one point in the center hole and press the other into the wood blank to make a small mark. Use a sharp pencil in the small mark and draw a circle on the blank by rotating the chuck by hand.
4. Drill a hole in the wood ring blank smaller than the ring blank OD, at least 1/4" deeper than the width of the SS insert.
5. Using your spindle gouge or a small scraper, widen the hole almost to the pencil line about 1/16" deeper than the than the width of the SS insert. Measure the hole diameter with dial calipers, and sneak up on the correct diameter so the SS insert will just fit it in the hole with

minimal slop. The difference in depth between the drilled and turned holes forms a shoulder to reference the ring insert against when gluing and leaves room for the excess CA glue, making it easier to clean up after it is parted off. NOTE – The sides of the hole should be straight and not angled. If the SS insert is not perpendicular to the hole axis, it will wobble and be difficult to part off or square the edge of the wood to the SS insert later.

6. Put a glove on and holding the ring on your finger, sand the outside of the SS insert with silicon carbide sandpaper or wipe with acetone or alcohol to remove oil from fingerprints.
7. Apply flexible CA to the sides of the hole of the ring blank and to the outer diameter of the SS insert. Push the SS insert into the hole, making sure it is against the shoulder and does not wobble as the chuck is turned by hand. Do not worry about the CA squeeze out as it will be cleaned up in subsequent steps.
8. Use accelerator to cure the CA. Make sure it is fully cured so the wood will not come off the insert later when it is being cut free.
9. Round the outside of the wood blank until it is about 1/4" thicker than the SS insert and turn back the wood flush to the right side of the SS insert. Note – you want the right side of the wood to be flush with the SS insert so it will be held square in the ring mandrel and will not wobble.
10. Part off the ring assembly just beyond the left side of the SS insert.
11. Scrape the excess CA out of the inside diameter of the SS insert and polish the insert ID with silicon carbide paper. If your chuck can hold the outside diameter of the ring, it can be used to more easily polish the inner diameter on the lathe. Any marks left by the chuck will be turned away in the next step.
12. Mount the ring assembly on the ring mandrel with the flush side against the ring mandrel shoulder and bring up the live center to expand the mandrel until the ring will not turn on the mandrel. Note - make sure the ring does not wobble when the chuck is turning. If it does, remove the ring and clean up the flush side with sandpaper on a flat surface and remount on the mandrel.
13. Turn the right side of the ring until the wood is flush with the SS insert.
14. Turn the outside diameter to the desired thickness and profile. Note – This is not the time to get a catch given all the effort that has gone into the ring so far. It may be best to turn thicker and sand to the desired thickness.
15. Sand to 600 or 800 grit.

<u>Finishing the Ring</u>

1. With the lathe running about 200 RPM, wipe the sanded surface with a paper towel moistened with accelerator.
2. With a separate folded paper towel, apply the CA with a quick wipe across the ring surface. DO NOT go back over it or make multiple passes.
3. Repeat Steps 1 and 2 until you have applied at least four to six coats. If there are no ridges in the finish, you are ready to buff to the final finish.
4. If there are ridges in the finish, remove the ring from the mandrel and hand sand the ring with 600 and then 800 grit sandpaper until the entire surface is uniformly frosty looking and all ridges

are removed. Take care not to sand through the CA finish (do not sand on the lathe or you to sand through the CA finish). If you think you have done so, apply a couple of more coats of CA and resand. To be safe, I always apply a second set of coats of CA by repeating steps 1 and 2.

5. Replace the ring on the mandrel and sand GENTLY with 2000 and 4000 Abralon. I also burnish with old worn out Abralon until a shine is achieved.
6. Buff with white diamond to a high gloss while rotating the ring. Do not buff hard or stay in one place or you will melt the CA finish.
7. Enjoy your new ring.

Table 1

Stainless Steel Ring Inserts

Size	I.D.	O.D.
5	0.620	0.778
6	0.647	0.809
7	0.689	0.840
8	0.717	0.874
9	0.749	0.900
10	0.785	0.941
11	0.818	0.972
12	0.849	1.005
13	0.880	1.034

All inserts are ~0.076" thick